

WHAT IS CLAIMED IS:

1. A surgical staple for use in creating an everted anastomosis of at least two anatomical structures, the staple comprising a staple body constructed for bending and at least two everting elements connected to the staple body, the everting elements protruding from the staple body, the staple body and the everting elements being constructed and arranged so that when the staple body is bent around cut ends of the anatomical structures, the everting elements are in an apposed relationship and the inner layers of the anatomical structures are held together between the everting elements to form the everted anastomosis.
2. The staple of claim 1, further comprising at least two spacing elements connected to the staple body, the spacing elements being constructed and arranged so that when the staple body is bent around the cut ends of the anatomical structures, the spacing elements are in an apposed relationship and the cut ends of the anatomical structures are held together between the spacing elements.
3. The staple of claim 2, wherein the distance between the apposed spacing elements is less than the distance between the apposed everting elements.
4. The staple of claim 2, wherein the apposed everting elements are closer than the apposed spacing elements to the lumen of the anastomosed anatomical structures.

5. The staple of claim 2, wherein the apposed spacing elements define an inner radius of the bent staple and the apposed everting elements define an outer radius of the bent staple, the radii being taken from the bend in the staple.

6. The staple of claim 2, wherein the spacing elements comprise collars disposed around the staple body.

7. The staple of claim 6, wherein at least one of the collars is constructed to slide along the staple body into apposed relationship with the other of the collars.

8. The staple of claim 2, wherein one of the spacing elements is disposed along the staple body and the other of the spacing elements is disposed adjacent the staple body.

9. The staple of claim 2, wherein the spacing elements are disposed closer to the middle of the staple than the everting elements.

10. The staple of claim 1, wherein the everting elements are disposed at the very ends of the staple body.

11. The staple of claim 1, further comprising a penetrating element constructed to penetrate the ends of the anatomical structures when the everting elements are in the apposed relationship.

12. The staple of claim 11, wherein the penetrating element is disposed at one end of the staple body.

13. The staple of claim 1, wherein the everting elements are offset from each other transversely with respect to the staple body.

14. The staple of claim 13, wherein the end of one of the everting elements is aligned with the staple body; further wherein one other of the everting elements is centered on the staple body.

15. The staple of claim 13, wherein one of the everting elements moves laterally with respect to the staple body as the staple is bent, such that the direction of closure of the staple is at an angle to the staple body.

16. The staple of claim 1, wherein the staple body is outside the lumen of the anastomosed anatomical structures when the everting elements are apposed.

17. The staple of claim 1, constructed such that the lumen of the anastomosed anatomical structures is free of exposure to the staple and to cut tissue edges of the anatomical structures.

18. The staple of claim 1, wherein the staple is formed of a memory metal.

19. A surgical staple for use in creation of an everted anastomosis between at least two anatomical structures, the staple comprising means for bending and means for everting connected to and protruding from the means for bending, the means for bending and the means for everting being constructed and arranged so that when the means for bending is bent around cut ends of the anatomical structures, the means for everting forms an apposed relationship and the inner layers of the anatomical structures are held together between the means for everting to form the everted anastomosis.

20. The staple of claim 19, further comprising means for spacing connected to the staple body, the means for spacing being constructed and arranged so that when the staple body is bent around the cut ends of the anatomical structures, the means for spacing are in an apposed relationship and the cut ends of the anatomical structures are held together between the spacing elements.

21. The staple of claim 19, wherein the means for everting and the means for spacing are disposed on opposite ends of the staple.

22. A surgical staple constructed to join at least two anatomical structures, the staple comprising:

a first everting platform disposed at a first end of the staple, the first everting platform being centered at the first end of the staple;

a second everting platform disposed at a second end of the staple, the second everting platform being connected at one end thereof to the second end of the staple, the first and second everting platforms being constructed to form an everted anastomosis of the anatomical structures;

a first spacing element disposed at the first end of the staple, the first spacing element being disposed adjacent the longitudinal axis of the staple;

a second spacing element disposed at the second end of the staple, the second spacing element being disposed along the longitudinal axis of the staple; and

a penetrating element for penetrating the anatomical structures, the penetrating element being disposed at the first end of the staple along the longitudinal axis of the staple.

23. The staple of claim 22, wherein the staple is constructed to bend to a closed configuration in which the second everting platform is disposed parallel to the first everting platform and in which the first and second everting platforms are disposed on the same side of the penetrating element.

24. The staple of claim 23, wherein in the closed configuration the first and second spacing elements are apposed.

25. The staple of claim 24, wherein in the closed configuration the first and second spacing elements and the penetrating element define an inner radius of the staple; further wherein in the closed configuration the first and second everting platforms define an outer radius of the staple.

26. The staple of claim 23, wherein in the closed configuration the staple is bent into a “U” shape to form two legs and a bend, the legs of the staple being offset from each other in two dimensions.

27. A method of closing a surgical staple, the method comprising:

moving a first everting platform disposed at one end of the staple to be parallel to and adjacent to a second everting platform disposed at an opposite end of the staple;

moving a first spacing element disposed at said one end of the staple to be apposed to a second spacing element disposed at said opposite end of the staple; and

disposing the first and second spacing elements adjacent to and generally parallel to a penetrating element of the staple, the penetrating element being constructed to penetrate anatomical structure.

28. The method of claim 27, further comprising moving the first everting platform in a direction of closure to its disposition parallel to and adjacent to the second everting platform, the direction of closure being disposed at an angle to a longitudinal axis of the staple extending between the first everting platform and the second everting platform.

29. The method of claim 27, wherein the first and second everting platforms are moved from an offset configuration, in which the first and second everting platforms are offset from each other

along their longitudinal axes, to a non-offset configuration, in which the first and second everting platforms are aligned with each other.

30. A device for use in creating an anastomosis of two anatomical structures, the anastomosis defining a central lumen, the device comprising:

penetration structure for penetrating and holding both anatomical structures at the anastomosis; and

eversion structure for everting an end of at least one of the anatomical structures, the eversion structure being disposed closer to the lumen of the anastomosis than the penetration structure, the eversion structure being constructed to accommodate the anatomical structures.

31. The device of claim 30, wherein the device is constructed from a memory metal such that a crimping tool is unnecessary to create the anastomosis.

32. The device of claim 30, further comprising spacing structure for providing space within the eversion structure to minimize tissue necrosis in the anatomical structures.

33. The device of claim 30, wherein the device is a surgical staple, further wherein the penetration structure defines an inner radius of the staple and the eversion structure defines an outer radius of the staple, placement of the inner radius and outer radius causing the staple to be excluded from the lumen of the anastomosis.

Figure 1. Schematic representation of the experimental design. The figure is divided into two main sections: 'Pretest' and 'Main Experiment'. The 'Pretest' section includes 'Pretest 1' and 'Pretest 2'. 'Pretest 1' shows a sequence of stimuli: a fixation cross, a target stimulus, and a response. 'Pretest 2' shows a sequence of stimuli: a fixation cross, a target stimulus, and a response. The 'Main Experiment' section includes 'Main Experiment 1' and 'Main Experiment 2'. 'Main Experiment 1' shows a sequence of stimuli: a fixation cross, a target stimulus, and a response. 'Main Experiment 2' shows a sequence of stimuli: a fixation cross, a target stimulus, and a response. The figure also includes a legend for the stimuli: 'Fixation cross', 'Target stimulus', and 'Response'.

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